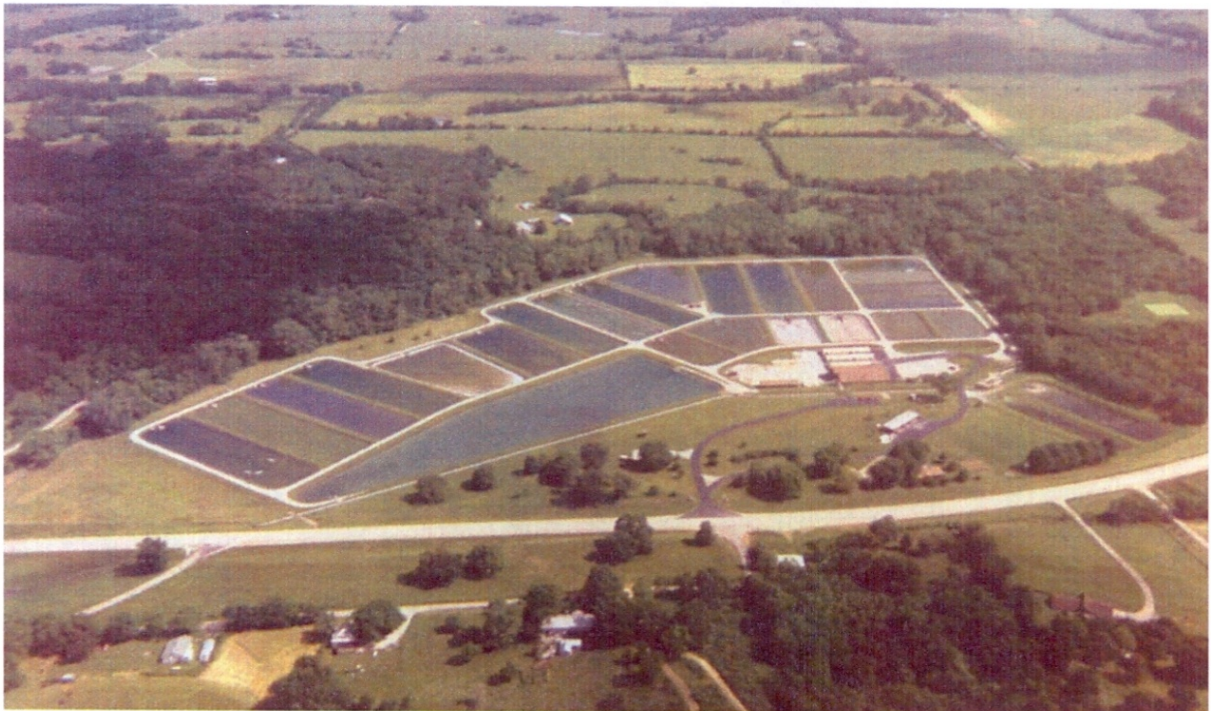


# Biosecurity Plan

## Chesapeake Fish Hatchery

### 2009



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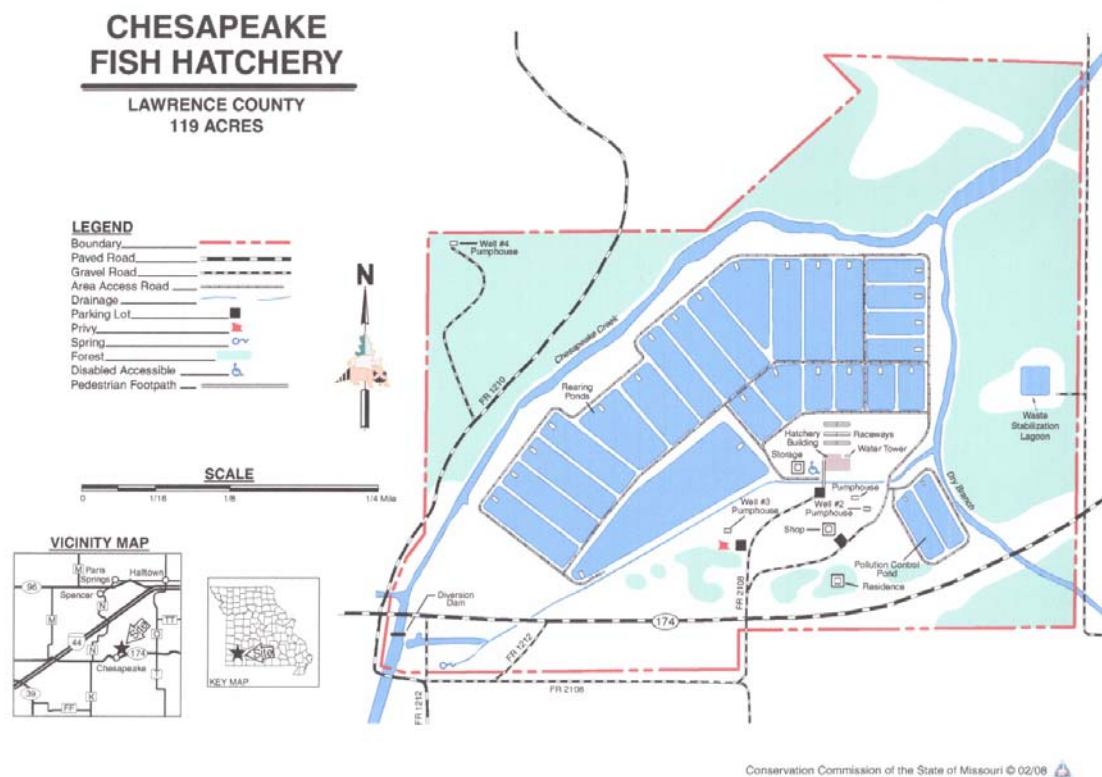


# Introduction

Chesapeake Hatchery is located nine miles east of Mt. Vernon, or 10 miles west of Republic, on Highway 174 near the town of Chesapeake in Lawrence County, Missouri. Chesapeake Hatchery is one of four warm water hatcheries operated by the Missouri Department of Conservation (MDC).

The land for Chesapeake Hatchery was originally purchased in 1926. In the 1930s new hatchery construction was started by the Civilian Conservation Corps and completed by the Works Progress Administration. These facilities were used for nearly 50 years until 1984, when a complete renovation of Chesapeake Hatchery began. By 1988, a completely new and modern hatchery had emerged.

The hatchery area consists of 119 acres, with the hatchery facility itself covering about 40 acres (Figure 1). The remainder of the area is dedicated to providing wildlife habitat.



**Figure 1.** Layout of Chesapeake Fish Hatchery.

The current hatchery comprises 13 one-acre ponds, 10 half-acre ponds, a half-acre kids fishing pond, a three quarter-acre pollution control pond, and a four-acre ambient water supply pond. In addition, there are 12 covered 7,875 gallon raceways and a 4,900 square foot fish production room. The fish production room contains eighteen 540 gallon fiberglass tanks, twenty-seven 55 gallon aluminum tanks, five 123 gallon aluminum tanks, and an egg battery capable of holding 60 egg jars and ten 30 gallon hatching tanks (Figures 2 and 3). There are also an additional twelve 16-gallon hatching tanks that can be set up when needed.

The primary water supply for the facility is Chesapeake Spring, which at average flow provides 500 – 1,000 gallons per minute (gpm). The spring flow can be supplemented with two wells (Well # 3 and Well # 4) capable of providing an additional 400 gpm each. Well # 3 is an electric powered well, and Well # 4 is a diesel powered well. The other water source for the facility is the four-acre ambient pond. Both the spring water and ambient water flow by gravity to the facility. All water sources for the facility can go to all areas where fish are produced (fish production room, ponds and raceways) (Appendix 4). No water is reused at the facility. It is a single-pass system. All water used for fish production is discharged into Chesapeake Creek or pumped into pollution control ponds. The facility is not required to have a Concentrated Aquatic Animal Production Facility discharge permit because the pounds of feed fed and the pounds of fish raised are below the Missouri Department of Natural Resources (DNR) guidelines for needing a discharge permit or to conduct water quality sampling.

Chesapeake Hatchery has an ultra violet (UV) sterilization unit set up to UV filter water that is pumped out of the spring channel to the heat templifier. This UV system is not currently being used for two reasons. First, the water from the spring channel is basically “clean water” so there is not much benefit to run it through a UV filter. Secondly, the unit needs new bulbs installed every other year. Replacing the bulbs costs approximately \$3,000, this makes maintenance cost prohibitive relative to benefits provided by the system. The current UV system can filter water from the ambient pond, but this requires pumping water which increases electric costs. The system provides 400 gpm even if only 200 gpm is needed which wastes water and energy. A more efficient and effective system would have UV filtration on the gravity-fed water line that comes to the hatchery building from the ambient pond. This would require installation of a new system or redesigning and moving the existing system. This arrangement would use less electricity and water, and definitely improve the quality of water coming from the ambient pond to the hatchery building where eggs are hatched and vulnerable fry are reared. This would still require approximately \$3,000 every other year for replacement bulbs. The initial installation costs are unknown, and there will need to be some planning and involvement with MDC engineering staff to develop a redesigned UV system.

Fish species produced at Chesapeake Hatchery can vary from year to year (Table 1).

Table 1. Average of the past five years of fish species, size, and numbers annually cultured at Chesapeake Hatchery.

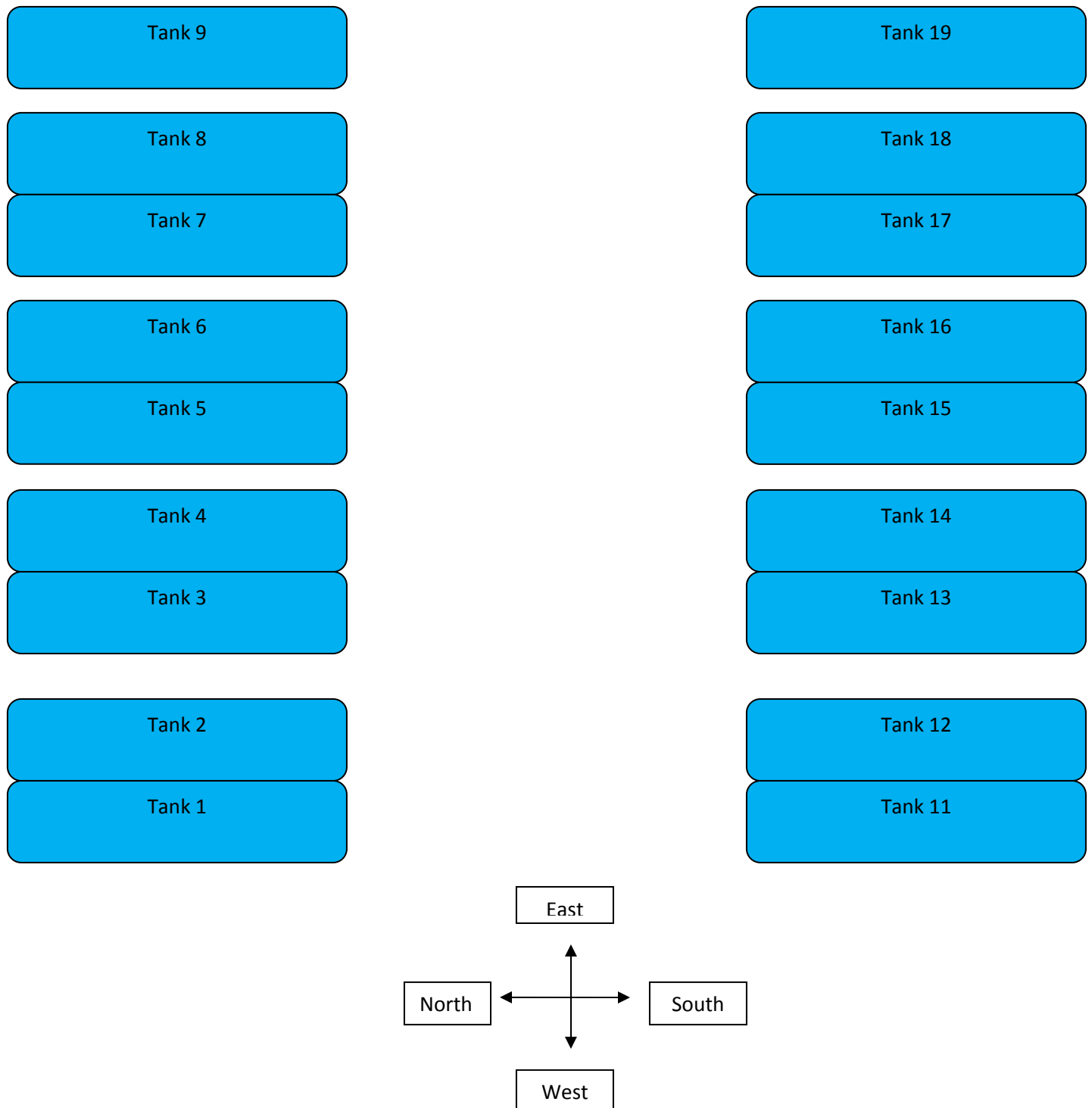
| Species         | Size    | Number    |
|-----------------|---------|-----------|
| Bluegill        | < 4"    | 890,000   |
| Channel catfish | fry     | 1,200,000 |
| Channel catfish | < 8"    | 30,000    |
| Channel catfish | 8 – 12" | 78,000    |
| Channel catfish | >12"    | 1,600     |
| Fathead minnows | < 2"    | 690,000   |
| Grass carp      | > 8"    | 3,500     |
| Hybrid sunfish  | 4 – 6"  | 7,500     |
| Largemouth bass | fry     | 325,000   |
| Largemouth bass | < 4"    | 50,000    |
| Largemouth bass | 4 – 8"  | 15,000    |
| Walleye         | fry     | 4,500,000 |
| Walleye         | < 4"    | 500,000   |
| Bluegill        | adults  | 1,500     |
| Channel catfish | adults  | 800       |
| Largemouth bass | adults  | 300       |

The hatchery also keeps adult fish on-site for annual production for the following species: bluegill, channel catfish, largemouth bass, and fathead minnows. In addition to the already mentioned species, other species that have been cultured at Chesapeake Hatchery include flathead catfish, blue catfish, muskellunge, paddlefish, trout, hybrid striped bass, and freshwater mussels.

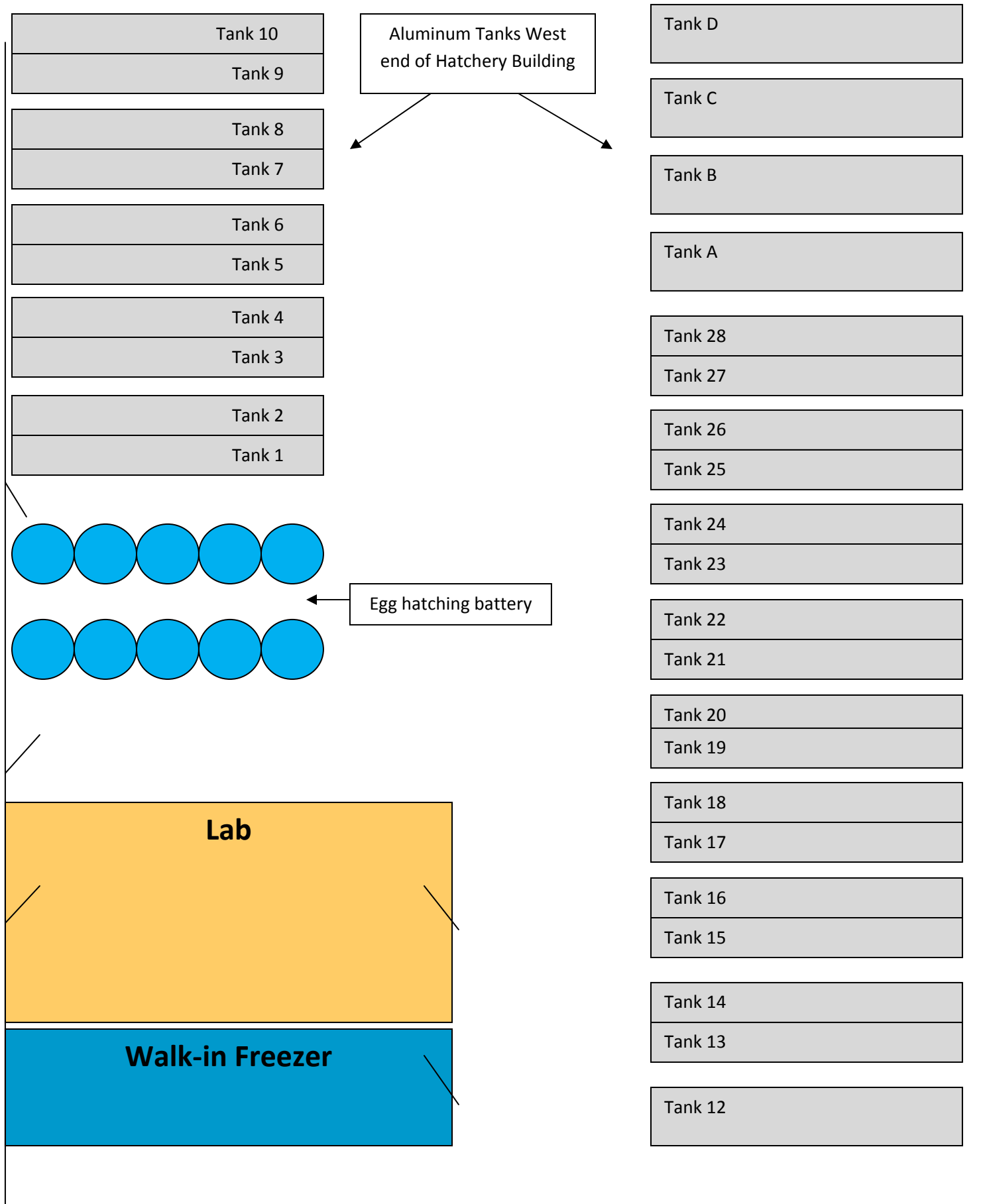
The purpose of Chesapeake Hatchery is to provide warm-water fish for stocking into state waters to achieve the goals and objectives of MDC's fisheries program.

### Management Priorities

- Provide for efficient management to achieve maximum fish production from the hatchery rearing facility.
- Implement fish culture techniques to produce the numbers and species diversity of warm-water fish as is compatible with space available.



**Figure 2.** Fiberglass tanks at east end of hatchery building.



**Figure 3.** Aluminum tanks at west end of hatchery building.

- Promote public awareness of fishing opportunities and hatchery programs.

## **Management Objectives**

1. Produce 400,000 early spawn channel catfish fry annually for statewide stocking of state-owned or managed waters and trading fry with other states.
  - Maintain 200 adult channel catfish at hatchery; rear replacement adults and add to spawning population every third year.
  - Manipulate water temperatures to induce catfish to ovulate 45 days earlier than normal by using a heat templier.
  - Inject female catfish with spawning hormones to trigger ovulation for optimum production schedules.
  - Pair and confine male and female adults to spawning pens until egg collection.
  - Collect and hatch approximately 40 pounds of eggs; attain at least a 70% hatch rate.
  - Utilize formulated dry diets, stocking densities and other techniques to sustain maximum growth to achieve 75,000 – 95,000 8 to 12-inch fish length by October 15.
2. Produce 500,000 pond spawn channel catfish fry annually for distribution to other warm-water state hatcheries for use in their hatchery programs and to trade fry with other states.
  - Maintain 300 adult channel catfish at hatchery; rear replacement adults and add to spawning population every third year.
  - Pair and spawn adults in ponds; collect 50 to 60 pounds of eggs annually.
  - Attain 70% – 80% hatch from collected eggs.
  - Rear fry on dry diet twenty days before transfer to other hatcheries.
  -
3. Produce sufficient numbers of fingerling largemouth bass, bluegill, and channel catfish to stock requested acres under guidelines of the Private Impoundment Program (PIP).
  - Maintain 200 largemouth bass adults and 500 bluegill adults to produce adequate fry for fingerling production. Channel catfish production for the PIP program is included in Item 2.
  - Fertilize rearing ponds with alfalfa meal to stimulate zooplankton production as required to produce fingerlings.

- Produce 50,000 largemouth bass, 500,000 bluegill, and 25,000 channel catfish fingerlings annually.
  - Coordinate delivery dates and notify pond owners of fish delivery schedules ten days prior to delivery.
  - Evaluate fish production annually and utilize modern culture techniques to improve efficiency and reduce costs associated with this program.
4. Utilize rearing facilities for production of specialty fish species as necessary to meet annual requests to maintain these fisheries in state-managed waters and trade with other states.
- Coordinate adult walleye needs with fisheries management personnel.
  - Collect wild walleye adults and induce ovulation for spawning.
  - Fertilize rearing ponds with alfalfa meal to stimulate zooplankton production as required to produce fingerlings.
  - Produce and distribute 500,000 walleye fingerlings annually.
  - Produce and distribute 5,000 4 to 6-inch hybrid sunfish and 1,600 channel catfish greater than or equal to 12-inches annually in the Southwest, Kansas City, Ozark and Southeast regions for the Kids Fishing Program.
  - Maintain fathead minnow adults for annual production of fingerlings for forage and stocking.
  - Utilize approximately 3,000 grass carp to control algae in production ponds and ambient pond and to fulfill stocking requests per hatchery commitment. Grass carp will be received from a hatchery operated by the Arkansas Game and Fish Commission.
  - Utilize dry feeds to feed train largemouth bass to be grown-out on formulated dry diets. Annually produce 15,000 advanced fingerling largemouth bass.
5. Increase public awareness of MDC programs and hatchery activities by conducting tours of the hatchery facility and presenting programs to community groups
- Provide presentations and give tours on hatchery activities or special fish rearing programs to interested groups.
  - Provide brochures and recommendations on fishing programs, fish identification, fish rearing, private pond stocking, and aquatic vegetation management.
  - Provide a variety of fish species for display purposes at the Ozark Empire Fair in Springfield.
  - Manage kid's fishing pond and stock fish for fishing events.



## Purpose of Biosecurity Plan

This biosecurity plan will identify potential threats to Chesapeake Hatchery and establish a protocol for reducing the probability for introduction of unwanted pathogens and nuisance species into the facility. This plan will also reduce the possibility of spreading disease within the facility or to other facilities or waters. We know that the channel catfish adults at Chesapeake Hatchery are carriers for channel catfish virus (CCV), and the largemouth bass adults were largemouth bass virus (LMBV) free on last testing in 2001.

Zebra mussels and viral hemorrhagic septicemia (VHS) are high profile threats to Chesapeake Hatchery. More immediate threats to the facility are Columnaris Disease (*Flavobacterium columnare*) and *Aeromonas* spp bacteria, and Ich (*Ichthyophthirius multifiliis*) and *Trichodina* protozoan parasites. The fish with the highest susceptibility to pathogens are those raised in the one-acre and half-acre ponds. However, all fish raised at Chesapeake Fish Hatchery are susceptible to disease outbreaks. Typically, channel catfish are the most susceptible, but other pond species cultured can encounter disease problems.

## General Equipment Use and Cleaning

**Background:** A variety of equipment is used at a Chesapeake Hatchery. Equipment and human hands are recognized as modes for pathogen transfer. Viruses, bacteria, and most parasites are invisible to the naked eye so their transmission via objects goes easily unnoticed. Examples of common equipment items are listed below.

1. Personal protective equipment: e.g., waders, hip boots, rubber boots, raingear, gloves.
2. Work equipment: e.g., dip nets, buckets, brooms, brushes, sponges, towels, feed blowers, and aerators, water pumps, weighing scales, crowding screens, hammers, and wedges.
3. Vehicle equipment: e.g., fish trucks, ATV, golf carts, pick-up trucks, boats, and fish loading pumps, boom trucks, tractor, and screen-puller.

### Highest Risks

1. Pathogens: bacterial, viral, parasitic.
2. Aquatic nuisance species.

### General Guidelines

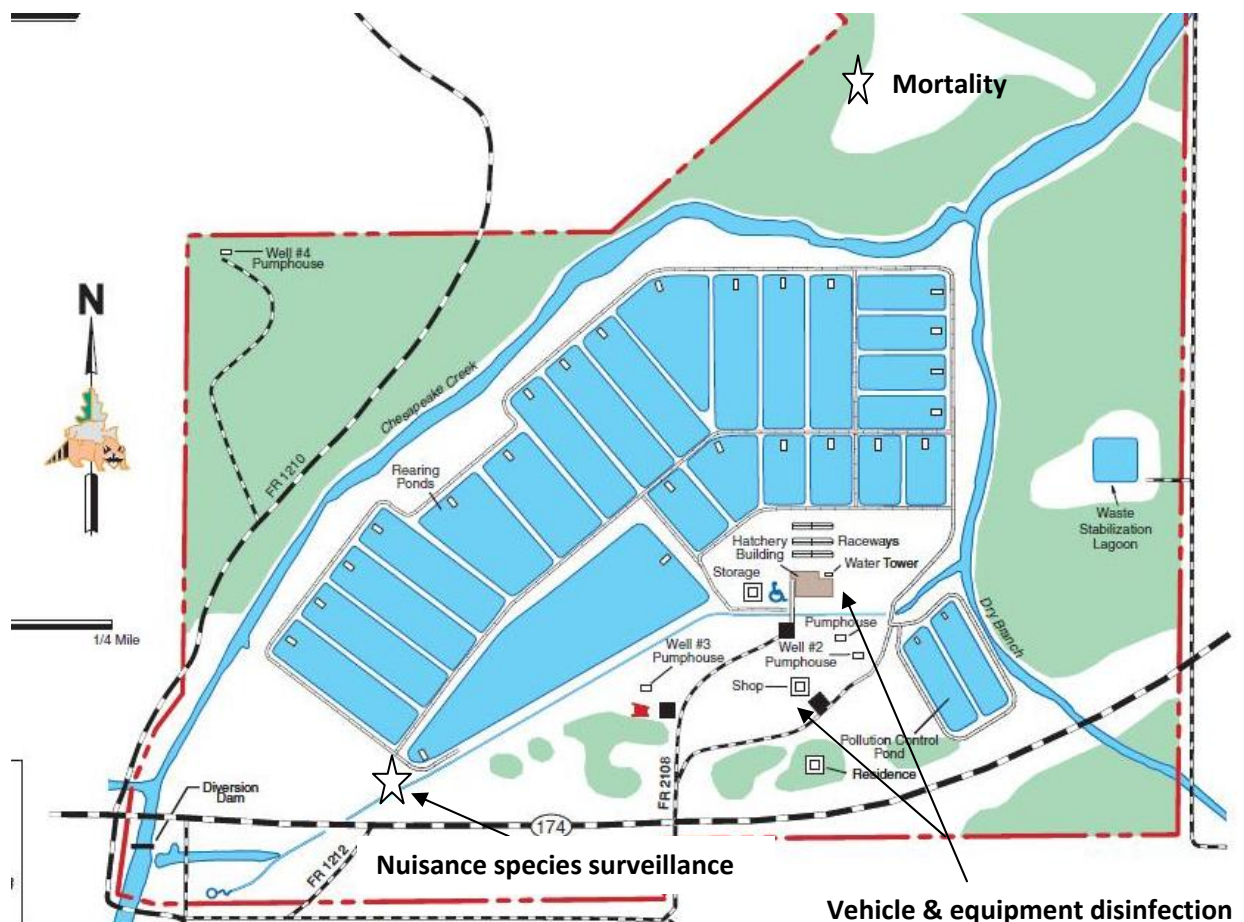
1. All equipment as a general rule shall be disinfected when that equipment comes into contact with a water source other than that of Chesapeake Hatchery, when it comes into contact with any units of sick fish, or between any areas that are considered sensitive (i.e., areas used to rear endangered species, rear fry, etc.).

2. The sharing of personal protective and work equipment between fish hatcheries is discouraged. Guest workers at Chesapeake Hatchery should be provided personal protective equipment to use during their visit. This equipment shall stay at this site. If on the rare occasion there is not enough equipment available for guests and they must use their own, these items should be thoroughly disinfected before and after use on-site. Proper disinfection of personal protective equipment is particularly relevant to periods when staff from other units work at Chesapeake during fish harvests and fish tagging events.
3. Equipment and protective clothing will be cleaned or disinfected at the east end of the hatchery building (Figure 4).
4. During cleaning, the layers of fish slime, mud, or organic debris will be removed first from all areas of vehicles and the inside and outside of transport tanks through brushing, hosing or power washing. The outside of the vehicle and inside and outside of the tanks will then be soaked or sprayed with disinfectant. Tubs of disinfectant solution will be conveniently placed in work areas.
5. Porous materials, such as wooden handles on dip nets, shall be eliminated and replaced with non-porous materials such as fiberglass or metal. If sponges or cloth towels are used, they shall be clean, changed daily or disinfected after each use.
6. Equipment will be stored at its location of use, if possible. For example, buckets and nets used in a hatching area should be stored in that area, labeled for use in that area, and only be used in that area.
7. Virkon® Aquatic is an environmentally-friendly disinfectant approved for aquaculture use. Iodine 1.75% is labeled for fish hatcheries as a hard surface disinfectant-sanitizer. Because of its staining ability and toxicity to fish, iodine should not be discharged without proper NPDES permit. (Ovadine® and Argentyne iodines are approved as *drugs* to disinfect fish eggs).
8. The concentration of reconstituted disinfectants shall be tested at least once every 4 days with test strips. If the solution has experienced evaporation or the active ingredient level is less than the recommended strength, it shall be refreshed or replaced with new disinfectant.

### **Vehicle Disinfection**

1. Vehicle equipment as a general rule shall be disinfected when that equipment comes into contact with a water source other than that of Chesapeake Hatchery or when it comes into contact with any fish that are sick.
2. Proper vehicle disinfection shall occur either en-route back to the hatchery (at a car wash) or at the designated vehicle cleaning station in the shop area (Figure 4).

3. The vehicle will initially be power washed to remove major debris, mud, and slime. The inside of transport tanks, buckets, and nets will be sprayed with disinfectant. The outside of the vehicle shall also be sprayed with a 200 ppm chlorine bleach solution and rinsed with fresh water. If chlorine bleach is used inside of transport tanks, it will be deactivated with sodium thiosulfate.
4. The vehicle will not be used for any additional loads until it has been disinfected.
5. Vehicles and containers used to transport dead fish from rearing units to the mort pit area shall be hosed out at the designated equipment cleaning area at least once weekly and disinfected. More frequent cleaning will be warranted if mortalities are high or there is spillage from buckets on to the bed of the vehicle.



**Figure 4.** Locations of vehicle and equipment cleaning stations (arrows), mortality disposal area (star), and surveillance site (star) for zebra and quagga mussels.

## Fish Transfers

**Background:** Fish are stocked into public waters, received from non-MDC hatcheries, captured from the wild, moved between MDC hatcheries, and moved within individual hatcheries as they grow and have changing space requirements. Pathogen transfer may occur during all of these activities.

Chesapeake Hatchery has a moderate risk for the introduction of pathogens from wild fish. Wild broodstock walleye are captured from rivers and reservoirs and held for approximately 7 days for spawning then they are returned to the wild. While they are on-site, they are kept in fiberglass tanks isolated from ponds, raceways, and the aluminum tanks.

### Highest Risks

1. Aquatic nuisance species and pathogens (parasitic, bacterial, viral)
  - a. Wild fish (unknown health status)
  - b. Non-MDC hatcheries
  - c. Between MDC hatcheries

### Wild Fish Transfers

1. All fish caught from the wild and transported to Chesapeake Hatchery shall be treated for zebra mussels per MDC policy (Appendix 1), and MDC broodstock collection (zebra mussel) HACCP (Appendix 5):

- 750 ppm KCL for 1 hour, then 25 ppm formalin is added for an additional 2 hours; and
- Total treatment time is 3 hours.

When possible, hatchery vehicles should be used to transport fish rather than stock tanks or live-wells.

2. For all VHS-susceptible species collected from the wild, their VHS status could be obtained by conducting "health surveillance testing" of the source population. Whether this method will be employed will be determined by Fisheries Leadership.

3. Any wild fish brought on to hatchery grounds shall not be co-mingled with established hatchery populations unless they pass 6 weeks of isolation in good health. An ideal quarantine area is "an isolated space separate from resident fish with dedicated equipment and supplies, limited foot-traffic and managed personnel and traffic flow" ( <http://www.flsart.org/PPT/AQU-EMQ-PPT-2007-01.ppt> retrieved 9/28/08). Wild fish brought to the hatchery to be used as broodstock (i.e., walleye, channel catfish, largemouth bass, bluegill, etc.) will be quarantined in fiberglass tanks on the east end of the hatchery building (Figure 2). Equipment used in the

collection and spawning of the walleye will be disinfected after walleye spawning is complete. Equipment used in the spawning of walleye will not leave the quarantine area unless it is first disinfected. Any wild fish that are kept on-site to supplement existing spawning stocks will be tested to verify the absence of any major disease concern.

4. Unhealthy wild fish or a representative sample of the population shall be evaluated and treated for parasites and diseases detected during quarantine. If unhealthy wild fish respond to treatments they will be kept on-site. Unhealthy wild fish may also be culled rather than undergo treatments.

5. Only healthy wild fish will be utilized for broodstock or other purposes.

6. All equipment used on wild fish in isolation shall not leave the isolation area and will be thoroughly disinfected after use. Any vehicles used to transport wild fish will similarly be cleaned and disinfected after use. The inside of hauling tanks will be rinsed with clean water after the disinfection process.

7. All eggs obtained from wild fish will be subject to iodine (Argentyne or Ovadine®) disinfection. This will be our accepted procedure after passing an experimental trial in 2010.

### **Transfers from non-MDC hatcheries**

1. Before a shipment of VHS-susceptible fish shall be received from a non-MDC fish hatchery, the shipper shall submit a current fish health inspection indicating that the lot or farm has been tested and found negative for VHS. The Aquatic Animal Health Specialist will review and approve the documents. Individual exemptions from this policy will be determined on a case-by-case basis. In addition, grass carp and other cyprinid species purchased and/or received from non-MDC sources shall be tested and found negative for spring viremia of carp virus (SVCV). Preference should be given to facilities which have "secure" water sources. These are water sources that are either bore holes, fishless springs, UV sterilized or well water.

2. In addition to inspection of this report, the hatchery manager shall ask the hatchery manager or other shipper to complete and return via FAX or email a "Fish Transfer Information Sheet" along with mortality records for the previous 15 days (Appendix 2). This sheet will help identify in writing any other pathogens/nuisance species not specified on the health inspection record that may occur in the facility's hatchery, watershed or site of fish collection. This would include viruses, parasites, zebra mussels, New Zealand mud snails, quagga mussels, rusty crayfish, parasitic copepods, and other species of concern.

3. During transport fish shall be treated for zebra mussels per MDC policy (Appendix 1):

- 750 ppm KCL for 1 hour, then 25 ppm formalin is added for an additional 2 hours; and
- Total treatment time is 3 hours.

4. The shipping containers received shall be returned to the shipper or sprayed with 500 ppm bleach or placed in trash for disposal.
5. If fish are received, they shall be isolated for 6 weeks and observed daily for signs of disease. Each tank, raceway, or pond shall be considered an isolation or quarantine unit.
6. All equipment used during the off-loading of these fish shall be immediately disinfected after use. The inside of hauling tanks will be rinsed with clean water after disinfection.
7. Viral or bacterial testing will occur, on an as-needed basis, for shipments of MDC fish to other states.

#### **Transfer of fish between MDC hatcheries**

1. Three days prior to the transfer of fish between MDC hatcheries, the shipping facility shall FAX or email to the receiving hatchery manager a "Fish Transfer Information Sheet" which will include mortality records for the previous 15 days (Appendix 2). When possible well, spring, or UV sterilized water will be used to transport fish rather than surface water.
3. Visibly abnormal fish seen by hatchery staff shall be culled prior to shipment.
4. During transport fish shall be treated for zebra mussels per MDC policy (Appendix 1):
  - 750 ppm KCL for 1 hour, then 25 ppm formalin is added for an additional 2 hours; and
  - Total treatment time is 3 hours.
5. Depending on the species and size, fish may be off-loaded into an "isolation" unit where the fish can be monitored and treated for post-transport disease outbreaks for at least 3 weeks before they are co-mingled with other resident fish.
6. Post-transportation stress in the fish may be reduced by providing 0.1-0.5% salt for 1-3 days after arrival.
7. Rubber boots and raingear worn during delivery of fish shall be sprayed with disinfectant before staff leave the receiving facility.
8. The transport truck shall be power washed and disinfected either en-route back to the hatchery of origin or at the designated hatchery cleaning site. It shall not be used for any additional loads unless it is disinfected. The inside of hauling tanks will be rinsed with clean water after disinfection.
9. All non-Chesapeake Hatchery hauling units and equipment used to harvest channel catfish at Chesapeake Hatchery during the fall catfish harvest will be disinfected prior to arrival and upon returning to the hatchery of origin.

## **General Sanitation**

**Background:** The maintenance of a high standard of general sanitation is a proven method for minimizing disease outbreaks in both human and veterinary practices. At Chesapeake Hatchery the following areas have been identified for general sanitation: (1) handling of fish mortalities from rearing units; (2) cleaning of rearing units between lots; and (3) cleaning of counters and floors in fish lab and production rooms.

### **Highest Risks**

1. Bacterial pathogens in dead fish are at peak levels; therefore their handling can be considered a serious mode of disease transmission.
2. Parasites and bacterial pathogens may be transmitted in water and/or fish waste products.
3. Bacterial and viral pathogens may contaminate hands, floors, and equipment in laboratory areas where sick fish are necropsied.

### **Fish Mortality Sanitation**

1. Specific equipment such as nets, buckets, and vehicles will be designated for picking up dead fish. Buckets and nets used for this activity will be prominently labeled and not be used for any other activity. When mort buckets are placed in vehicles, they shall be set in a secondary pan containing 1-2" of disinfectant. This will allow the bottom of the bucket to be constantly disinfected while in use and it will help prevent water and slime from contaminating the bed of the vehicle.
2. A large bucket containing disinfectant should be available for soaking nets between uses. Ideally, while a net is being used, another one can be soaking before it is used again.
3. Mortalities will be removed daily from rearing units.
4. Small numbers of mortalities shall be taken to a mort pit area that will be fenced for composting. Large numbers of fish that would be too many for composting will be buried. This area is not fenced but is well-isolated from hatchery ponds (Figure 4).

At Chesapeake Hatchery, frozen dead trout from Roaring River Hatchery, Bennett Springs Hatchery, and Shepherd of the Hills Hatchery have been fed to channel catfish broodstock after being chopped in a wood chipper. It is recommended that only mortalities associated with environmental problems be used in this manner to minimize the likelihood of pathogen transfer to Chesapeake fish. It is recognized that trout are screened annually for serious viral pathogens like viral hemorrhagic septicemia, but this does not totally eliminate risk associated with using these fish. In the future, Shepherd of the Hills and Roaring River hatcheries will be the primary suppliers of dead frozen trout for feeding channel catfish broodstock at Chesapeake.

5. Personnel shall wash their hands with soap and water or use hand sanitizer after collecting and disposing dead fish. Hand sanitizers shall be conveniently placed in all vehicles.
6. The vehicle used to transport dead fish shall be hosed out at the designated equipment cleaning area at least once weekly and disinfected. More frequent cleaning will be warranted if mortalities are high or there is spillage from buckets onto the bed of the vehicle.

### **Cleaning Rearing Units**

1. Between lots of fish, rearing units shall be dewatered completely when possible.
2. On outdoor raceways, a power washer shall be used to remove organics from the sides and bottoms of the raceways. If possible, this may be followed by steam cleaning for 5 minutes. Units will then be left to dry for as long as possible.
3. Indoor tanks will be scrubbed, sprayed with disinfectant, and washed out with clean water before next use. The application of steam for 5 minutes is another option for a very thorough disinfection. Salt may be used as an abrasive.
4. Organic wastes in lined outdoor ponds will be removed by spraying and/or vehicles when applicable. The ponds will be allowed to dry as long as possible.

### **Fish Lab**

1. When sick fish are brought into the lab for necropsy, both infected water and fluids often find their way to floors and counters. The following measures shall be taken to reduce contamination:

At the completion of work in the lab, the counters and floor will be sprayed or mopped with 500 ppm chlorine bleach (sodium hypochlorite) or 0.5% Virkon® Aquatic spray (Table 2).

A floor mat with disinfectant will be placed at the lab exit into the production room.

2. For routine laboratory cleaning and disinfecting of floors, 0.5% Virkon® Aquatic or 500 ppm chlorine bleach (sodium hypochlorite) is recommended. Lower level, less corrosive disinfectants such as Roccal or Hyamin (quaternary ammonium compounds) or Lysol (phenol compound) are satisfactory.
3. Spent scalpel blades, needles, and microscope slides used during evaluations will be disposed of in a "sharps container". Plastic loops used for bacterial cultures will be disposed in



Table 2. How to prepare a solution of household bleach (sodium hypochlorite) solution for disinfection.

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(ppm Na hypochlorite desired) (gal of water) (128)

% of active Na hypochlorite (10,000) = Ounces of household bleach needed

e.g. (500 ppm) (1 gal)(128) = 1.2 oz of 5.25% bleach per gallon of water  
 5.25% (10,000)

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a heavy-duty plastic container. Sharps and loop containers will be disinfected with 1 part bleach and 9 parts water for at least 1 hour prior to disposal in general trash.

### **Production Room for Fry**

1. Areas where eggs are hatched and fry reared shall be kept clean at all times.
2. All equipment used for eggs and fry shall be designated for the production room only.
3. When possible, each tank or set of tanks shall have its own net and brush. If nets or brushes are shared, they shall be appropriately disinfected between uses.
4. Floors of the production room shall be mopped daily with a disinfectant if an outbreak of disease causing high mortality is occurring. It shall also be power washed or hosed down and sprayed with disinfectant before and after walleye spawning and fry distribution, after early spawn channel catfish fry distribution, and after pond spawn channel catfish fry distribution.
5. A mat containing a disinfectant will be placed at all door entrances to the production room.

## **Broodstock Management**

At Chesapeake Hatchery both captive and wild-caught broodstock are utilized. Species typically maintained as captive broodstock include largemouth bass, bluegill, green sunfish, fathead

minnows, and channel catfish. Wild fish utilized as broodstock include walleye. For other species like grass carp, fry or fingerlings may be imported from an out-of-state source.

There are approximately 200 captive early spawn channel catfish broodstock, 300 captive pond spawn channel catfish broodstock, 200 captive largemouth bass broodstock, 500 captive bluegill broodstock, and 100 lbs. of captive fathead minnow broodstock on-site. Once broodstock become too old or unreliable for spawning purposes, they are culled from the spawning population. Most replacement broodstock is reared on-site from captive broodstock offspring. The possibility of adding wild fish to the broodstock population exists. The process dealing with the addition of wild broodstock to the hatchery spawning population is discussed in the Fish Transfers section.

### **Highest Risks**

1. Viral pathogens (viral hemorrhagic septicemia, channel catfish virus, largemouth bass virus, spring viremia of carp)

### **General Guidelines**

1. At the time of spawning staff will select only apparently healthy fish for spawning. In particular, fish with poor body condition, ulcerated skin, hemorrhagic skin, darkened skin, exophthalmia, a hemorrhagic vent, or very pale gills shall be culled from the breeding population.
2. All hatching supplies (bowls, feathers, nets, aprons, pans, screens, hatching jars, buckets, etc.) shall be disinfected with 100 ppm iodine for at least 15 minutes and rinsed with fresh water before use. Towels shall be clean and changed frequently when used.
3. Since egg disinfection protocols for cool- and warm-water fish are not well defined at this time, it is recommended that facilities utilizing wild caught fish start to conduct their own bio-assays in 2010 utilizing an egg disinfection protocol (e.g. Wisconsin Department of Natural Resources egg disinfection methods or United States Fish and Wildlife Service egg disinfection protocol for Genoa National Fish Hatchery). Data collected should include iodine concentration, pH, % eye-up, % hatching success, and abnormalities of untreated vs. treated eggs. Only iodine approved for use on fish eggs like Argentyne or Ovadine® should be utilized.
4. The LMBV status of the adult largemouth bass maintained at Chesapeake Hatchery should be updated in 2010. If new broodstocks are not produced on-site, the source population will need to be carefully selected and screened before new fish are added to the population.
5. VHS status could be obtained by conducting "health surveillance testing" of source populations for brood fish collected from the wild. Whether this method will be employed will be determined by Fisheries Leadership.

6. Chesapeake Hatchery staff believe that wild fish (walleye) brought into the hatchery and used as broodstock can be effectively quarantined in fiberglass tanks on the east end of the hatchery building. This quarantine area is separate from ponds and raceways. There is no co-mingling with other hatchery fish. When walleye broodstock are brought into the hatchery building for spawning, they are the only fish inside the building. Once spawning is complete, all tanks, floor and equipment can be disinfected before other fish are brought into the hatchery building. The walleye broodstock are only on-site for approximately seven days. A trial disinfection protocol can be tried to disinfect walleye eggs. This would eliminate the need for a separate quarantine spawning facility.

## **Public Use**

**Background:** Each year approximately 500 people visit Chesapeake Hatchery. Currently, the public is welcome to freely explore areas around our outdoor pools and guided tours are provided inside the hatching areas. Chesapeake Hatchery has ponds specifically dedicated for "Kid's Fishing" and other special needs events. MDC encourages educational interaction with the public at all fish hatcheries.

In addition to humans, our fish hatcheries also have wildlife visitors. Wildlife frequenting facilities include great blue herons, bald eagles, skunks, raccoons, muskrats, possums, and various waterfowl. Wildlife not only prey upon fish, but can also transfer diseased fish from one area to another and regurgitate partially eaten food. They are recognized as biological vectors of disease.

### **Highest Risks**

#### Humans

Although the risk is ranked as low, footwear and hands of visitors may transfer undesirable pathogens, parasites, or aquatic nuisance species (e.g., zebra mussels) onto facilities (muddy shoes or bait bucket releases) or between rearing units (if hands are put in the water).

#### Wildlife

The mechanical transfer of diseased fish or aquatic nuisance species.

### **General Guidelines-Humans**

1. Public traffic around outdoor rearing areas is unavoidable.
2. Where possible, fish at greatest risk of disease should be located as far away from frequent foot traffic as possible.

3. If a rearing unit is experiencing high mortality, a sign should be posted at the unit to indicate that these fish are under therapy and that hands are not permitted in the water. This would also serve as a reminder to staff to be more careful.

### **Kid's Fishing Ponds**

1. Live bait other than worms will be prohibited from the Kid's Fishing Pond. In particular, bait buckets shall be prohibited and indicated on area signage. Chesapeake Hatchery will provide all equipment and bait needed at the Kid's Fishing Pond. No outside equipment will be allowed.

### **General Guidelines-Wildlife**

1. The following steps may be undertaken to discourage nuisance wildlife residence at Chesapeake Hatchery.
  - a. The area where mortalities will be disposed will be fenced, sides and top, or if the fish are buried in a pit, the dead fish will be covered with dirt upon disposal. Covering them with dirt will make them less accessible to nuisance wildlife.
  - b. Dead fish will be removed from rearing units on a daily basis.
  - c. Inside production buildings, dead fish will be placed in the freezer until disposal rather than being flushed down effluent water.
  - d. Feed storage areas will be kept clean and tidy.
  - e. Trapping and bird control measures, as allowed by an appropriate depredation permit, will be implemented.

## **General Disease and Aquatic Nuisance Species Surveillance**

**Background:** Implementation of a surveillance program will provide a means of detecting the presence of aquatic nuisance species and pathogens for early intervention and help provide bench marks for eradication measures.

### **Highest Risks**

1. Viral pathogens: VHS, CCV, LMBV, spring viremia of carp, sturgeon iridovirus, Herpes virus
2. Parasites: parasitic copepods (*Actheres* spp., *Argulus* spp., anchor worms), Ich, trematodes, *Trichodina*, *Costia*, *Chilodonella*, *Epistylis*
3. Bacteria: *Edwardsiella ictaluri*, *Flavobacterium columnare*, *Aeromonas* spp., *Pseudomonas* spp.
4. Aquatic nuisance species: zebra mussel, New Zealand mud snails, quagga mussels, etc.

## General Guidelines

1. Effective staff education is the number one preventive measure for disease surveillance. Education will provide a means for staff to recognize problems and take steps to correct them.
  - a. Recommend that each staff member take the Basic Fish Health class provided by MDC.
  - b. If there is interest, the MDC Aquatic Animal Health Specialist will be available to provide additional on-site training or refreshing of fish diagnostic techniques.
2. Artificial substrates for detecting zebra and quagga mussels will be placed in the spring branch near the west end of the production ponds (Figure 4). These monitoring units will be constructed using layers of discarded plastic signs (Figure 5). They will be visually monitored at least every 30 days. Directions for making this monitoring unit are provided in Appendix 3.



**Figure 5.** Example of an artificial sampler for zebra and quagga mussels new and after 7 months of deployment in a zebra mussel positive water body (from Brian McKeage, MDC).

3. The MDC Aquatic Animal Health Specialist or other approved individual will conduct fish health testing for viruses and bacteria on an as needed basis until a firm policy is established by Fisheries Leadership.
4. Fish displaying abnormal behaviors (going off feed, changes to skin color, reddened fins, increased mortalities, etc.) will be promptly evaluated on-site by general external appearance, skin scrape, and gill biopsy, at a minimum, and treated appropriately. If initial therapy is unsuccessful or if additional tests are needed which are not available on-site (e.g., bacterial culture, histopathology), they will be referred to the MDC Aquatic Animal Health Specialist or other approved individual for further evaluation.

5. Mortality records will be maintained on tracking sheets for each rearing unit. These records will be sent to other fish hatcheries prior to fish transfers and will provide a means of monitoring fish health and preventing the spread of disease.

## **Fish Vaccinations**

**Background:** In 2001, Chesapeake Hatchery started vaccinating channel catfish fry with enteric septicemia of catfish (ESC; *Edwardsiella ictaluri*) vaccine. In 2006, the hatchery also started vaccinating channel catfish fry with Columnaris vaccine. The vaccines are the only USDA approved vaccines on the market for channel catfish. The vaccine is a live attenuated vaccine. The vaccine must be purchased in ten, 100,000 lot doses, and must be stored at -70 degrees Fahrenheit in a freezer on-site.

### **General Guidelines**

1. Vaccines will be stored in freezer at -70 degrees Fahrenheit before use.
2. Channel catfish will be vaccinated between 7 and 10 days old.
3. Fish will be held off feed 24 hours before vaccinations.
4. Fish will be sample counted to facilitate fish lot determination the day before the vaccinations.
5. Vaccines will be thawed and split into 5 equal parts (five, 20,000 fish lots).
6. One gallon of water will be put into a 5-gallon bucket with an air stone. A total of 20,000 fish will be put into the 5-gallon bucket.
7. Once the fish are in the 5-gallon bucket, the vaccines will be added. After 2 minutes, the 5-gallon bucket will be filled to the top and allowed to set for 30 minutes.
8. Dissolved oxygen will be monitored during the 30-minute period.
9. At the end of the 30-minute period, vaccinated fish will be poured into 55-gallon aluminum tanks.
10. After vaccinations are finished for the day, the floor will be washed down.
11. When fish are vaccinated, the following information is needed for hatchery records:

1) copy of the vaccine label; 2) date when vaccinated; 3) lot number and expiration date on the vaccine label (sometimes this is available as a peel off sticker); 4) the identity of the group(s) of fish vaccinated; and 5) total number of fish vaccinated.

## **Fair Fish**

**Background:** Chesapeake Hatchery maintains a half acre pond with an assortment of native Missouri fish that are used for display at the Ozark Empire Fair in Springfield. These fish are in a pond at the hatchery all but 14 days out of each year. The only time they leave the hatchery is to be put on display.

1. Fair fish will be quarantined in a half acre pond at Chesapeake Hatchery.
2. The origin of any new fish coming into the pond will be determined and a zebra mussel treatment required per MDC policy (Appendix 1):
  - 750 ppm KCL for 1 hour, then 25 ppm formalin is added for an additional 2 hours; and
  - Total treatment time is 3 hours.
3. Fish traveling to and from display tanks will be treated for zebra mussels per MDC policy (Appendix 1).
4. Hauling tanks, truck, and any associated equipment will be sanitized appropriately.

## **Mussels**

**Background:** Freshwater mussels (Neosho mucket, fat mucket, white heel splitter) have been cultured on fish at Chesapeake Hatchery fish since the late-90s. This process is done in conjunction with Missouri State University and Dr. Chris Barnhart. Each year MDC has approximately 300,000 juvenile mussels requested for stocking purposes.

Broodstock mussels are not brought onto the hatchery site. Only glochidia from inside the mussels are brought on-site. Host fish are only on-site about ten days after inoculation. Host fish are the only fish in the hatchery building at the time of mussel culture. All equipment, tanks, and floor areas will be disinfected after mussel culture is completed. With the host fish being quarantined in fiberglass tanks and limited outside water (consisting of the small amount of water that the glochidia are in: approximately 2 quarts) being brought on-site, the risk to Chesapeake Hatchery is minimal during mussel culture efforts.

1. Host fish, largemouth bass approximately 4 inches reared on-site at Chesapeake Hatchery, are quarantined in fiberglass tanks in the hatchery production room.

2. Fish are crowded into the upper end of the tank and inoculated with a concentrated bath of glochidia for approximately 15 minutes.
3. After inoculation, the fish are allowed to remain in the tank for approximately 10 days while glochidia mature on the gills of the host fish.
4. Before glochidia drop off the gills, host fish are transferred to Missouri State University. Specialized tanks are located at the university to collect juvenile mussels dropping off the gills of the host fish. No zebra mussel treatments can be done on these fish due to the fact that it would kill the freshwater mussels that are being cultured.
5. Host fish will not return to Chesapeake Hatchery after going to Missouri State University.
6. Hauling tanks, truck and associated equipment will be sanitized after dropping off host fish at Missouri State University.
7. Any mussel equipment brought onto Chesapeake Hatchery will be properly disinfected and rinsed with fresh water prior to any contact with hatchery ponds, tanks or water.



## Budget Considerations (2009 Pricing)

| Item(s)           | Use/Need                  | Quantity   | Total Costs |
|-------------------|---------------------------|------------|-------------|
| Virkon®           | Sanitizer                 | 20 tubs    | \$1,368.00  |
| Tubs              | sanitizing equipment      | 2 tubs     | \$100.00    |
| Buckets           | handle mortalities        | 10         | \$30.00     |
| Dip nets          | replace wooden nets       | 3          | \$822.00    |
| Mort nets         | raceway and ponds         | 2          | \$388.00    |
| Hudson sprayer    | for spraying disinfectant | 3          | \$200.00    |
| Hand disinfectant | sanitize between tanks    | 24 bottles | \$108.00    |
| Broom handles     | replace wooden handles    | 22         | \$775.00    |
| Crowding screens  | replace wooden screens    | 20         | \$1,200.00  |
| Test strips       | test Virkon® sanitizer    | 10 boxes   | \$374.00    |
| Foot mats         | entrance foot mats        | 7          | \$623.00    |
| Dip nets          | rearing room tanks        | 51         | \$1,800.00  |
| Power washer      | steam sanitizer           | 1          | \$3,600.00  |
| Iodine            | egg disinfectant          | 1          | \$25.00     |
| Viral assays      | LMBV testing              | 1          | \$600.00    |
| Viral assays      | out-of-state transfer     | 2          | \$1,600.00  |
| UV bulbs          | UV filter                 | 20         | \$3,000.00  |
| UV system         | Solar pond?               | 1          | ?           |
| Vehicles          | Chemical damage           |            | ?           |
| Miscellaneous     | Incidentals               | ?          | \$500.00    |

## Summary

The most important measure of any plan is getting people to accept the plan and to follow the established guidelines. All biosecurity measures are intended to help prevent introduction or spread of unwanted pathogens in a hatchery situation. The most important preventive measures will be getting staff thinking in the mindset of biosecurity and how their actions can affect fish health. The initial set-up of all biosecurity measures for Chesapeake Hatchery will cost approximately \$17,000.00. After the initial set up, \$2,000.00 each year should cover the biosecurity needs at Chesapeake Hatchery. In FY2010 Chesapeake Hatchery has a CI project for construction of a new shop building. This new shop building should be designed with a wash bay for truck sanitation.

## **ZEBRA MUSSEL PREVENTION**

### **POLICY**

*The Missouri Department of Conservation will work to prevent the spread of zebra mussels from infested waters to uninfested waters.*

est. 10/05

### **PROCEDURES**

#### **● RESOURCE THREAT**

Zebra mussels can clog power plants, industrial and public drinking water intakes, foul boat hulls, decimate populations of freshwater mussels and other native aquatic organisms, impact fisheries and disrupt aquatic ecosystem functions. Economic impacts of zebra mussels in North America are estimated to be in the billions of dollars.

Because of the ease with which microscopic larval zebra mussels may be transported by the public, it may take several years to detect an infestation. Avoiding known infested areas, or staging equipment use such that waters known, or suspected to be infested, are visited last, will help prevent the spread of zebra mussels. However, boats, equipment, and gear must be decontaminated prior to use in different waters. Personnel will take reasonable precautions to avoid exposure of equipment, facilities, and other waters to zebra mussels.

#### **● PUBLIC OUTREACH AND EDUCATION**

Increased public outreach and education will enhance understanding of the potential problems associated with zebra mussels and the measures that may help deter their expansion. Signs should be posted at all MDC owned and managed boat ramps highlighting the potential problems associated with zebra mussels. Information should be distributed through our state, federal and non-governmental agency partners, MDC managed waterfowl areas, trapping associates, sport fishing groups, marinas, lake associations, Department offices and Nature Centers, media outlets and to other water users in Missouri.

#### **● EQUIPMENT DECONTAMINATION PROCEDURES**

Appropriate safeguards to prevent the transfer of zebra mussels from one waterbody to another are mandatory and include inspection, treatment, and, if possible, avoidance. The following steps detail equipment decontamination procedures:

1. Thoroughly inspect boats (hulls, drive units, trim plates, transducers), trailers and components (rollers, bunk boards, axles, etc.), equipment (i.e., water pumps, hatchery

equipment, siphons, nets, ropes, traps, etc.), and machinery (tractors, bulldozers, etc.) for adult zebra mussels. Pay close attention to nooks, crannies and other inconspicuous places (i.e., around the motor housing, trim tabs, and water intake screens, or pump fittings). All trash, mud, vegetation, and suspected zebra mussels should be removed and properly disposed of in the trash. Immediately report suspected occurrences of zebra mussels to the Invasive Species Coordinator.

Carpeted bunks and runners on existing boat trailers should be replaced with poly, plastic or wooden bunks as soon as practical; boat trailers regularly moved between known zebra mussel infested waters and other waters should have carpeted bunks and runners replaced immediately. As available, future boat trailers should be purchased with poly/plastic/wooden bunks.

2. All water should be drained from boats, trailers, motors, live wells, bilges, transom wells, holding tanks and live wells, water pumps, pipes, and other equipment prior to leaving a waterway. Pay particular attention to boat hulls under installed decking. Drain as much water as possible from equipment such as lower motor units and portable pumps.

3. Any boat, trailer, tank, equipment, machinery, gear, or net transferred from one body of water into a different body of water or from known infested waters to potentially infested waters must be decontaminated using one of the treatments in Table 1 prior to being used in a new body of water. Equipment decontamination procedures should be completed when moving equipment from infested areas of a water body to uninfested areas of the same water body.

If boats, nets, and other equipment are only used in one body of water, cleaning between uses is not necessary, but these boats, nets, and other equipment **MUST** be clearly labeled for use in that body of water **ONLY**. Periodic cleaning and decontamination (i.e., during winterization or other maintenance) should be conducted to prevent costly repairs. If management or research activities require this equipment to be moved in the future, decontamination procedures will be implemented.

## ● **HATCHERY PRECAUTIONS**

Best management practices should be used to protect equipment and facilities and to reduce the opportunity for the spread of zebra mussels to uninfested areas. Introductions of zebra mussels into MDC fish hatcheries or water supply sources would have devastating impacts upon hatchery infrastructure. If infested, hatcheries would then be a possible mechanism for transporting the organisms to uninfested waters.

Therefore, the following precautionary measures will be enacted by MDC fish hatcheries:

1. All attempts will be made to secure fish from sources known to be free of zebra mussels (veligers and adults) (see map at <http://intranet/Documents/17407.pdf>)
2. All fish and eggs exposed to surface water coming into or leaving any of MDC's hatcheries or other facilities and any fish procured through contract or other means from outside sources must be treated during transportation using one of the treatments in Table
3. The only exception will be for fish that are stocked into the same water supply that is used by the hatchery (e.g., trout stocked in Bennett Spring branch by Bennett Spring Hatchery staff) and for selected species of conservation concern.
3. Specific limitations may be applied to native mussel and hellbender culture, and other species of conservation concern, on a case-by-case basis.
4. Some species or life stages of fish or other aquatic organisms may be less tolerant of chemical treatments. For these species or life stages whose chemical tolerances are unknown, bioassays must be performed prior to large scale use of the prescribed treatments listed below. Until these bioassays are conducted, brood stock of these species will only be obtained from waters known to be free of zebra mussels.

| Zebra Mussel Disinfectants and Usage Guidelines for Boats and Equipment |               |  |   |
|---|---------------|--|---|
| Disinfectant  | Concentration | Contact Time                             | Usage Guidelines, Safety Precautions, Drawbacks   |
| Vinegar   | 100%          | 20 min                                   | Use appropriate personal protective equipment (PPE) and caution. Stay upwind of the spray. Is corrosive to metal and toxic to fish at this concentration, so thoroughly rinse with tap water or water from the next lake or river after disinfection. Ensure that solution does not run-off directly into waterways.        |
| Chlorine  | 200 ppm       | 10 min                                   | Use appropriate PPE and caution. Stay upwind of the spray. Is corrosive to metal and rubber and toxic to fish at this concentration, so neutralize with 800 ppm sodium thiosulfate and rinse thoroughly with tap water or water from the next lake or river. Ensure that solution does not run-off directly into waterways. |
| Power wash with hot water   | >104° F       | 20 min                                   | Use appropriate PPE and caution when using hot water due to possibility of burns/scalding. Temperature and contact times are crucial, as efficiency is weather dependent. Most effective when used in conjunction with air drying (see below). Power wash with hot water, including thoroughly flushing lower motor unit.   |
| Freezing  | <32° F        | 24 hrs                                   | Boats, gear, and equipment should be thoroughly frozen. Ambient air temperature should remain below freezing for the entire contact time. No safety precautions.  |
| Air drying  | N/A           | 3-5 days in hot sun<br>48 hrs in hot sun | Must dry completely to be effective. Most effective when used in conjunction with hot water (see above).<br>To be used for small nets, gear, pumps, etc., <i>ONLY AFTER</i> power washing with hot (104°) water for appropriate contact time.   |
| Salt Bath   | 1%            | 24 hrs                                   | Due to the long contact time, may only be used as a bath solution and not sprayed. To be used only for pieces of equipment, gear, and nets that can be completely immersed in the solution.   |

| Table 2. Disinfectant Amounts to Make Needed Concentrations |                    |                    |                    |                      |                     |
|---|--------------------|--------------------|--------------------|----------------------|---------------------|
| Disinfectant  | 1 gallon           | 2 gallons          | 5 gallons          | 20 gallons           | 100 gallons         |
| 100% Vinegar  | 1 gal              | 2 gal              | 5 gal              | 20 gal               | 100 gal             |
| 200 ppm Chlorine (household bleach, 5.25% Chlorine)         | 0.5 ounce (15 ml)  | 1.0 ounce (30 ml)  | 2.5 ounces (75 ml) | 11.0 ounces (300 ml) | 6 1/3 cups (1.5 L)  |
| 200 ppm Chlorine (HTH granular)                             | 0.04 ounce (1.2 g) | 0.08 ounce (2.4 g) | 0.2 ounce (6 g)    | 0.8 ounce (24 g)     | 4.2 ounces (120 g)  |
| 800 ppm Sodium Thiosulfate                                  | 0.1 ounce (3 g)    | 0.2 ounce (6 g)    | 0.5 ounce (15 g)   | 2.1 ounces (60 g)    | 10.6 ounces (300 g) |
| 1% Salt Bath (as NaCl)                                      | 1/8 cup            | 1/4 cup            | 2/3 cup            | 2 2/3 cups           | 13 1/3 cups         |

Notes:

1. Air drying and hot water are most effective when used in conjunction with each other because their effectiveness is highly dependent upon ambient temperatures and contact times. As needed, hot water wash units should be made available at selected Department facilities.
2. Household bleach (5.25% chlorine) and vinegar can be purchased from grocery or convenience stores. HTH granular chlorine (70% calcium hypochlorite) and Sodium Thiosulfate can be purchased at pool supply stores or chemical companies.
3. All bilges and hidden areas under boat decks must be thoroughly treated as described above.
4. Source: WI DNR (2007) *Equipment Disinfection Protocol for Invasive Species and Viruses*.

| Table 3. Hatchery/Fish/Aquatic Organism Zebra Mussel Treatments and Usage Guidelines |                 |              |  |
|--|-----------------|--------------|--|
| Treatment  | Concentration   | Contact Time | Usage Guidelines/Comments  |
| NaCl   | 20,000 ppm      | 2 hrs        | Used for striped bass only. Treatment conducted during transport.  |
| KCl/formalin   | 750 ppm KCl     | 1 hr         | Used for all other fish species and eggs. Fish and hauling water are pretreated for 1 hour with 750 ppm KCl, followed by a 2 hour treatment with 25 ppm formalin during transport. <i>DO NOT</i> treat fish with NaCl to counteract shock, as this decreases the effectiveness of the treatment. |
|  | 25 ppm formalin | 2 hrs        |  |

Notes:

1. All fish, including those used in aquaria at nature centers, fairs, etc., are to be treated for zebra mussels while in transit.
2. Treatment concentrations and contact times that are currently exceeded during normal aquaculture operations (e.g., egg hardening and shipping) should be considered effective.
3. Some species or life stages of fish or other aquatic organisms may be less tolerant of chemical treatments. For these species or life stages whose chemical tolerances are unknown, bioassays must be performed prior to large scale use of the treatments listed above.
4. For species with known intolerances to recommended zebra mussel treatments, modifications of hatchery assignments, increased use of well water, UV treatment, sand filtration, and other system modifications or treatment/avoidance measures may be needed and should be considered on a case-by-case basis with the involvement and approval of Division Chiefs and the Invasive Species Coordinator.
5. Sources: IA DNR *Fairport Fish Hatchery ANS-HACCP*, Edwards *et al.* 2000.

## • INVASIVE SPECIES COORDINATOR ROLE

The MDC Invasive Species Coordinator shall serve as the central point of contact for zebra mussel distribution information, prevention, and control. The coordinator shall maintain a Missouri zebra mussel distribution map on the Department Intranet and Internet websites identifying the location of confirmed sightings of zebra mussel adults and veligers in Missouri waters (see <http://intranet/Documents/17407.pdf> or <http://mdc4.mdc.mo.gov/Documents/17409.pdf>). Any collections, observations, sightings, etc., of zebra mussel adults or veligers, including instances when organisms have been found attached to equipment, must be immediately reported to the MDC Invasive Species Coordinator.

*5/08(est. 10/05)*

Appendix 2 . Fish Transport Information sheet.

***(Submit via email at least 3 days prior to shipment)***

Today's date: \_\_\_\_\_

Anticipated shipment date: \_\_\_\_\_

From: ☐ Blind Pony ☐ Chesapeake ☐ Hunnewell ☐ Indian Trail ☐ Lost Valley ☐ Paho ☐ Other: \_\_\_\_\_

To: ☐ Blind Pony ☐ Chesapeake ☐ Hunnewell ☐ Indian Trail ☐ Lost Valley ☐ Paho ☐ Other: \_\_\_\_\_

Species: \_\_\_\_\_

Age: ☐ Eggs ☐ Fry ☐ Fingerling ☐ Adults

Lot Designation: \_\_\_\_\_

From Rearing unit: \_\_\_\_\_

**Lot History**

Mortality record for last 15 days provided (see page 2)?

☐ Yes

☐ No

Fish will be taken off feed 24 hours prior to shipment?

☐ Yes

☐ No

Fish were last on the following water source: ☐ Spring ☐ Surface ☐ U/V treated ☐ Well water

The following aquatic nuisance species occur in this hatchery's watershed or the site of fish collection:

☐ Zebra mussels ☐ Parasitic copepods ☐ Rusty crayfish ☐ Quagga mussels

☐ New Zealand mud snails ☐ Other: \_\_\_\_\_

General Health within last 30 days: ☐ Excellent ☐ Good ☐ Fair ☐ Poor ☐ Unknown  
(Basis of this classification: ☐ Mortality records ☐ Observation/feed intake ☐ Necropsy: gills, skin, organs)

If fair or poor: what problems were observed or suspected? \_\_\_\_\_

Any chronic problems? \_\_\_\_\_

| Therapeutic Used in last 30 days | Yes<br>✓                 | Date Treated | Why treated? | Results or Comments (cured problem; partial, little or no improvement) |
|----------------------------------|--------------------------|--------------|--------------|--|
| None                             | <input type="checkbox"/> |              |              |  |
| Aquaflor                         | <input type="checkbox"/> |              |              |  |
| Copper sulfate                   | <input type="checkbox"/> |              |              |  |
| Formalin                         | <input type="checkbox"/> |              |              |  |
| Iodine                           | <input type="checkbox"/> |              |              |  |
| Immersion OTC                    | <input type="checkbox"/> |              |              |  |
| MS-222                           | <input type="checkbox"/> |              |              |  |
| Oxytetracycline                  | <input type="checkbox"/> |              |              |  |
| Perox-Aid                        | <input type="checkbox"/> |              |              |  |
| Potassium permanganate           | <input type="checkbox"/> |              |              |  |
| Potassium chloride (KCl)         | <input type="checkbox"/> |              |              |  |
| Romet                            | <input type="checkbox"/> |              |              |  |
| Salt- NaCl                       | <input type="checkbox"/> |              |              |  |
| Vaccine (specify)                | <input type="checkbox"/> |              |              |  |
| Other (specify)                  | <input type="checkbox"/> |              |              |  |



Mortality Record Previous 15 days

| Date  |     |                   |
|-------|-----|-------------------|
| Month | Day | Daily Mortalities |
|       |     |                   |
|       |     |                   |
|       |     |                   |
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|       |     |                   |
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|       |     |                   |

### Appendix 3. Directions for constructing a device to monitor for zebra mussels.

They are pretty simple to make. All you need is 10 old MDC plastic signs, a piece of 5/16" all thread with a loop bent in the top, 1" pieces of 1/2" cpvc pipe and a nut and washer. Drill a hole through the signs, place the signs on the all thread with a loop, put the cpvc pipe pieces in to space out the signs and finish by putting the nut and washer on after the last sign. You can then tie a rope to the loop and hang the monitor up in the water body.

Scott has the picture of the monitor before we put it in the water.



Thanks,

Brian McKeage

Fisheries Specialist  
1907 Hillcrest Dr.  
Columbia, MO 65201  
573-884-6861

[illegible]

| <b>HACCP Step 1 - Activity Description</b>                       |   |
|--|---|
| <b>Facility:</b><br>Lost Valley Hatchery/Statewide Facilities    | <b>Site:</b><br>Lake of the Ozarks Below Truman Dam<br>and Various Waters Statewide   |
| <b>Project Coordinator:</b><br>Brent Filley                      | <b>Project Description:</b><br><br>Collect fish from the Lake of the Ozarks<br>and other locations statewide to be used<br>as broodfish |
| <b>Site Manager:</b><br>Rich Cook/Randy Terrell                  |   |
| <b>Address:</b><br>28232 Hatchery Ave.<br>Warsaw, Missouri 65355 |   |
| <b>Phone:</b><br>660-438-4465                                    |   |

| <b>Project Description</b><br><b>(Who, What, Where, When, How &amp; Why)</b>  |
|---|
| <p>Central Region Fisheries Management and Lost Valley Hatchery staff participates in the collection and transfer of walleye from the tailwaters of Truman Dam on the Lake of the Ozarks to Lost Valley Fish Hatchery during March 17 to April 1 annually by methods of electrofishing for the purpose of propagation. Fish (e.g., paddlefish) are collected at other locations statewide using electrofishing or nets and transferred to this and other hatcheries for use as broodstock on an annual basis. An electrofishing boat is used to collect fish with dipnets or fish are netted using a variety of passive gear and are then placed into holding tanks on boats. Adult fish are sampled to select fish ready to spawn. Selected broodfish are loaded onto a hauling truck equipped with live hauling tanks. Fish are transported to Lost Valley Hatchery or other hatchery facilities where fish are netted from the truck and placed in prepared holding tanks for spawning purposes.</p> |

## HACCP Step 2 - Potential Hazard Identification

**Vertebrates:**

**Invertebrates:**

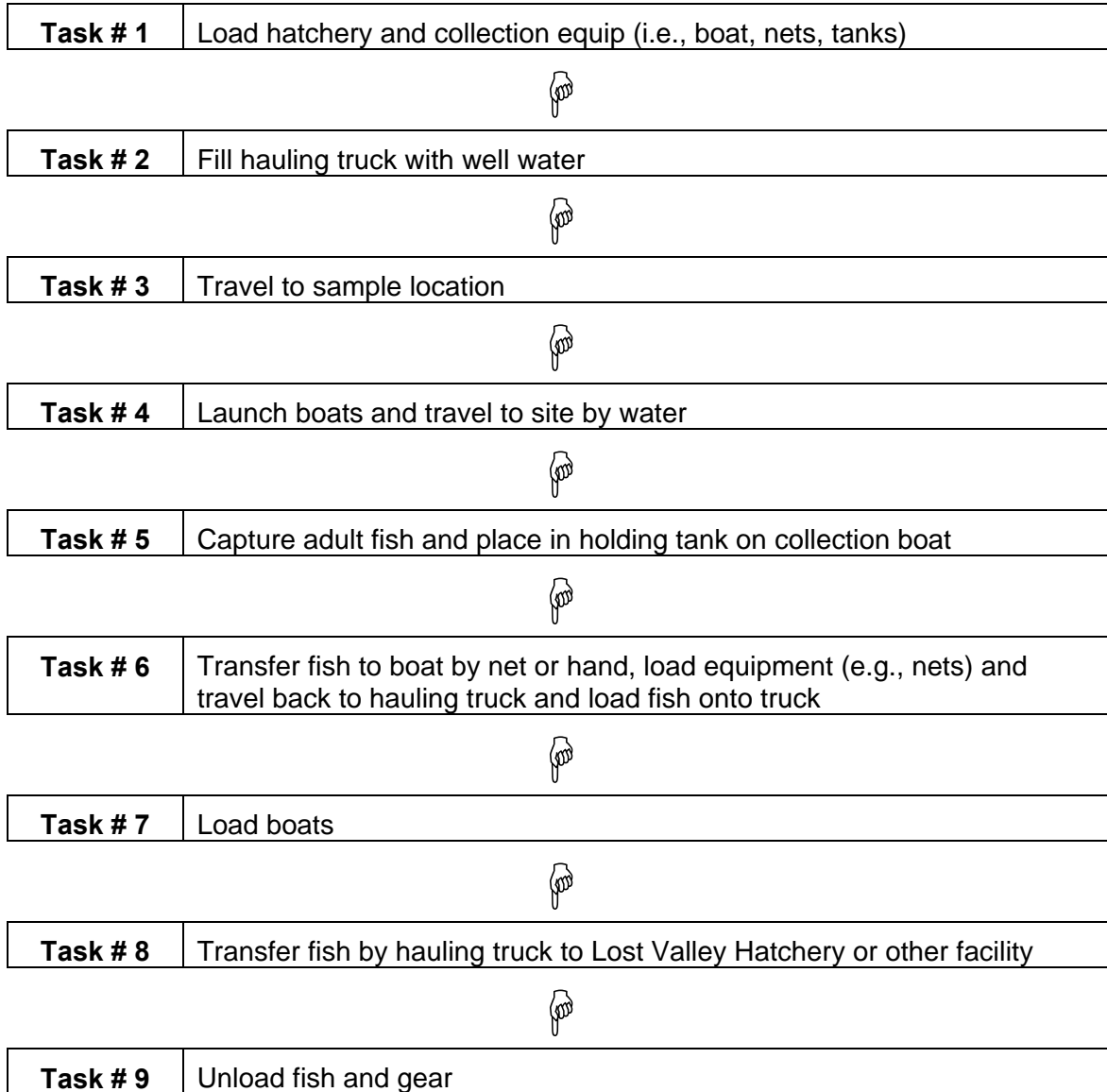
Zebra Mussels

**Plants:**

**Other Biologics:**

**Others:**

### HACCP Step 3 - Flow Diagram



### HACCP Step 4 - Hazard Analysis

| Task  | Hazard                      | Probable? | Justification  | Control Measures   | CCP? |
|---|-----------------------------|-----------|--|--|------|
| Load hatchery and collection equip (i.e. boat, nets, tanks)   | Invertebrate: zebra mussels | No        | Equipment should be clean and dry (5-7 days)                                 |  | No   |
| Fill hauling truck with well water  | Invertebrate: zebra mussels | No        | Well water is free of contaminants   |  | No   |
| Travel to sample location   | Invertebrate: zebra mussels | No        | Equipment should be clean and dry  |  | No   |
| Launch boats and travel to site by water  | Invertebrate: zebra mussels | No        | Task is confined to one location   |  | No   |
| Capture adult fish and place in holding tank on collection boat   | Invertebrate: zebra mussels | No        | Task is confined to one location   |  | No   |
| Transfer fish to boat by net or hand, load equipment (e.g., nets) and travel back to hauling truck and load fish onto truck | Invertebrate: zebra mussels | Yes       | Potential zebra mussel veligers being transferred by water, nets and by fish | Well water in hauling truck is treated using the three hour zebra mussel treatment protocol: 3 hours Potassium Chloride @ 750 ppm, and final two hours with Formalin 37 % @ 25 ppm | Yes  |
| Load boats  | Invertebrate: zebra mussels | Yes       | Transfer of veligers in live wells, by nets, boat, boat motor and trailer    | Drain bilge pumps, live wells, and lower unit at lake ramp site  | No   |
| Transfer fish by  | Invertebrate: zebra mussels | No        | Fish and water have  |  | No   |

|   |                             |     |   |  |     |
|---|-----------------------------|-----|---|--|-----|
| hauling truck to Lost Valley Hatchery or other facility |                             |     | been in zebra mussel treatment for the required three hours |  |     |
| Unload fish and gear                                    | Invertebrate: zebra mussels | Yes | Potential contamination of equip                            | Nets, boats, motors, trailers tanks are power washed and allowed to dry 5-7 days | Yes |



## HACCP Step 5 - HACCP Plan

### Critical Control Point #1:

**Task # 6: Transfer fish to boat by net or hand, load gear (e.g., nets) and travel back to hauling truck and load fish onto truck**

**Significant Hazards:**

Invertebrate: zebra mussels

**Control Measures:**

Well water in hauling truck is treated using zebra mussel treatment protocol :  
3 hours Potassium Chloride @ 750 ppm, and final two hours with Formalin 37 % @ 25 ppm

**Limits for Control Measures:**

Water and fish should be treated with the zebra mussel treatment for the required three hours

**Monitoring: What?**

Water in the hauling tanks

**Monitoring: How?**

Visual inspection

**Monitoring: Frequency?**

Once before addition of fish to the tank

**Monitoring: Who?**

Hatchery staff

**Evaluation & Corrective Actions:**

None

**Supporting Documentation:** Reference related HACCPs and MDC policy.

### Critical Control Point #2:

**Task # 9: Unload fish and gear**

**Significant Hazards:**

Invertebrate: zebra mussels

**Control Measures:**

Nets, boats, motors, trailers tanks are power washed and allowed to dry 5-7 days

**Limits for Control Measures:**

Clean equipment with a high pressure wash and allow to dry for 5-7 days

**Monitoring: What?**

Equipment is monitored for presence of standing water.

**Monitoring: How?**

Visual inspection

**Monitoring: Frequency?**

Once before equipment is used again

**Monitoring: Who?**

Hatchery staff

**Evaluation & Corrective Actions:**

|   |  |
|---|--|
| Tag equipment as unclean and require wash and drying before using again   |  |
| <b>Supporting Documentation:</b> Reference related HACCPs and MDC policy. |  |
|   |  |
| <b>Facility:</b><br>Lost Valley Hatchery/Statewide Facilities             | <b>Activity:</b><br>Collect fish from the Lake of the Ozarks and other locations statewide to be used as broodfish |
| <b>Address:</b><br>28232 Hatchery Ave.<br>Warsaw, Missouri 65355          |  |
| <b>Signature:</b>   | <b>Date:</b>   |

## **HACCP Checklist:**

### **Collect fish from the Lake of the Ozarks and other locations statewide to be used as broodfish.**

**Facility**            Lost Valley Hatchery/Statewide Facilities  
**Site**                Lake of the Ozarks Below Truman Dam and Various Waters Statewide  
**Coordinator**      Brent Filley  
**Manager**           Rich Cook/Randy Terrell  
**Address**           28232 Hatchery Ave., Warsaw, Missouri 65355

- ☐ **Task # 1: Load hatchery and collection equip i.e. boat, nets, tanks**
- ☐ **Task # 2: Fill hauling truck with well water**
- ☐ **Task # 3: Travel to sample location**
- ☐ **Task # 4: Launch boats and travel to site by water**
- ☐ **Task # 5: Capture adult fish and place in holding tank on collection boat**
- ☐ **Task # 6: Transfer fish to boat by net or hand, load equipment (e.g., nets) and travel back to hauling truck and load fish onto truck**

#### **CRITICAL CONTROL POINT**

- ☐ Hazards were contained  
Hazards: Invertebrate: zebra mussels
- ☐ Control measures were implemented  
Control Measures: Well water in hauling truck is treated using zebra mussel treatment protocol : 3 hours Potassium Chloride @ 750 ppm, and final two hours with Formalin 37 % @ 25 ppm
- ☐ Control limits were maintained  
Control Limits: Water and fish should be treated with the zebra mussel treatment for the required three hours
- ☐ Corrective actions were (performed if necessary)  
Corrective Actions: None

- ☐ **Task # 7: Load boats**
- ☐ **Task # 8: Transfer fish by hauling truck to Lost Valley Hatchery or other facility**
- ☐ **Task # 9: Unload fish and gear**  
**CRITICAL CONTROL POINT**
  - ☐ Hazards were contained  
Hazards: Invertebrate: zebra mussels
  - ☐ Control measures were implemented  
Control Measures: Nets, boats, motors, trailers tanks are power washed and allowed to dry 5-7 days
  - ☐ Control limits were maintained  
Control Limits: Clean equipment with a high pressure wash and allow to dry for 5-7 days
  - ☐ Corrective actions were (performed if necessary)  
Corrective Actions: Tag equipment as unclean and require wash and drying before using again